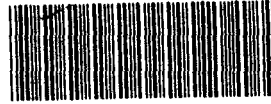


STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

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Roy Romer
Governor

Thomas M. Vernon M.D.
Executive Director

U S Department of Energy
Rocky Flats Plant
Rockwell International
P.O. Box 464
Golden, Colorado

Re: Comments on Trial Burn Plan

Attention: Mr. Albert E. Whiteman, DOE Area Manager
Mr. Dominic J. Sanchini, Rockwell

Dear Mr. Whiteman and Mr. Sanchini:

Enclosed are comments on the Trial Burn Plan for mixed and hazardous waste. This submittal includes our original comments of January 22, 1987, the Environmental Protection Agency's (EPA) comments, and a composite of all the applicable technical comments we have received from interested parties during the comment period. We note that many of the comments composited from the public may be repetitive of our's and EPA's comments. We also realize that comments have been previously addressed at information meetings or in other documents. We ask that all these comments be addressed in your written response. All responses should be supported with calculations and assumptions.

We encourage the efforts you are making towards waste minimization and waste destruction. The proposed incineration of mixed and hazardous wastes offers a permanent management solution through waste destruction. We ask that the U.S. Department of Energy and Rockwell International continue to explore and promote waste management strategies such as minimization, recycling, and destruction which provide safer solutions.

This transmittal constitutes the department's Notice of Deficiency with respect to the Trial Burn Plan portion of the Part B permit application, pursuant to the Colorado Hazardous Waste Act.

We recognize that every option of waste management involves risks. Our goal as a regulatory agency is to minimize these risks. The enclosed comments provide efforts towards reaching this goal. Please address these comments in writing within 30 days.

If you have any questions on this issue please contact Peter Bierbaum at telephone number 331-4830.

Sincerely,

Peter Bierbaum
Public Health Engineer
Colorado Department of Health

Mary J. Gearhart, P.E.
Section Chief, Permits
Colorado Department of Health

ADMIN RECORD
SW-A-003838

cc: Lou Johnson, EPA
Bill Christopher, Westminster City Manager
Neal Berlin, Arvada City Manager
George DiCiero, Broomfield City Manager
Jack Ethredge, Thornton City Manager
David Hawker, Northglenn City Manager
Jim Piper, Boulder City Manager
Glen Hill, Golden, City Manager
George Mathews, Boulder County Health Dept.
Denny Murano, Jefferson County Health Dept.
John Plog, Air Pollution Control Division, CDH
Al Hazle, Radiation Control Division, CDH

COMPOSITE OF TECHNICAL COMMENTS RECEIVED DURING COMMENT PERIOD

DEMONSTRATIONS PRIOR TO TRIAL BURN:

An area of concern on which we have received repeated comments relates to the ability of the facility to establish the incineration process as a proven technology. The facility has repeatedly stated that the proposed incineration process including the filter system is a proven technology. The following items are needed in order to support this statement.

1. Facility representatives have recently acknowledged the previous use of the fluidized bed incinerator to incinerate radioactive materials. This earlier use of the incinerator should be described in detail along with an explanation of why this information was not disclosed initially. The description should include:

- Analysis of all wastes and materials incinerated
- Operating ranges for all process variables
- Results of any emission monitoring conducted during the incineration period
- The purpose of the incineration run
- The incineration run protocol
- A summary of the results and conclusions drawn from this incineration

The trial burn plan also references extensive laboratory testing which was used to design the fluidized bed incinerators. A summary of the laboratory results should also be included.

2. The incinerator should be operated during a "shake-down" period prior to the trial burn. During this "shake-down" period the incinerator should only be used for non-hazardous materials. Explain how the incinerator will be tested prior to the trial burn to demonstrate operational readiness. Describe the length of testing, feed materials, and operating criteria which will be established for the "shake-down" period.

3. The ability of the fluidized bed process to destroy hazardous constituents and the ability of the HEPA filtration system to remove radioactive constituents should be supported by existing test data. The facility should provide any information previously collected on the destruction efficiency of the fluidized bed process, and the removal efficiency of the HEPA filtration process. Information is provided in the trial burn plan on the previous PCB incineration. However, summaries should also be provided on any trial burns conducted at other DOE facilities which relate to the fluidized bed process. With regards to HEPA filtration, the facility should provide information from controlled testing of the systems and representative data from other onsite uses of HEPA filtration. What other methods of particulate removal (ie. scrubbing, electrostatic precipitation) have been evaluated?

WASTE FEED COMPOSITION:

1. The facility should provide a more detailed description of the waste streams which will be incinerated during on-going operations, including the current backlog and the waste streams proposed to be incinerated during normal production operations. What are the chemical compositions of these waste streams? What values exist for key incineration waste parameters such as heat content, chlorine content, radioactive constituents, ash content, solids content, viscosity, etc. What are the expected values for future waste streams and what are the existing values for wastes currently being stored for incineration?

2. During the trial burn period the incinerator's performance should be demonstrated on worst case waste streams. The facility will not be allowed to incinerate a waste category which has not been demonstrated during the trial burn process. The waste streams proposed for the trial burn do not adequately represent the actual wastes to be incinerated during on-going operations. Specific concerns are:

-Plutonium content: the trial burn process does not include any waste tests with plutonium waste streams. If the facility intends to incinerate plutonium-containing wastes in the future these should be included in the trial burn. Both liquid and solid waste streams containing radioactive constituents should be run during the trial burn. The demonstrations should be performed stepwise, with non-radioactive runs conducted first, followed by runs conducted on uranium-containing wastes, and lastly runs conducted on plutonium-containing wastes. The facility should report results demonstrating the incinerator's ability to successfully handle each step before proceeding onto additional wastes.

-Plastics, PVC, latex, and other solids: The solid materials used to make up the feed composition for the trial burn should be representative of actual solid waste streams which will be sent to the incinerator during on-going operations. Paper material is not representative of these wastes. The solid feed should be a composite of plastics, PVC, latex and other materials which are representative of types of wastes expected to be present during on-going operations.

-Other Radioactive Constituents: If the facility expects other radioactive constituents to be present in on-going operations these should be accounted for during the trial burn. The facility should either include these constituents in the trial burn feed or explain how these constituents are accounted for by demonstrations with uranium and plutonium.

-Chlorine Content: The trial burn plan proposes a maximum carbon tetrachloride content of 19%, and a maximum organic chloride content of 17.5%. Are these levels the maximum expected for actual waste streams? Again, the maximum levels should be demonstrated during the trial burn.

3. The feed composition for the trial burn runs should be described in detail. What will be the physical nature of the plutonium and uranium to be burned? What will be the radioactive levels and the isotopic distribution for these constituents? What total quantity of plutonium and uranium will be used?

4. During the feed process non-combustibles are sorted out and removed prior to the waste entering the incinerator. Describe how these non-combustibles are identified and where they are sent.

DESIGN:

1. The facility should describe the original design basis for the fluidized bed incinerator. What criteria were established for construction, materials, and performance? What quality control/quality assurance was used during design and construction?

2. The rationale behind the selection of certain process features should be presented. Specifically:

-Catalyst: Why is chromic oxide on alumina selected as the oxidation catalyst?

-Air Pollution Control: Why was the air pollution control system consisting of cyclones, a sintered metal filter, and a series of HEPA filters selected? Why does the system not include any wet scrubbing?

OPERATION:

1. The trial burn process proposes an operating temperature range of 500 to 610 degrees Centigrade in the primary reactor and 475 to 650 degrees Centigrade in the afterburner reactor. The trial burn plan explains that the incinerator is designed to achieve the required destruction at these lower operating temperatures. What design considerations have been chosen to allow for this lower temperature range? Specifically, the effects of catalytic oxidation and fluidization turbulence should be explained in order to support these lower temperatures.

2. The trial burn plan does not clearly state whether the cooling water system is isolated from the incinerator waste and emissions. Is the cooling water a closed system?

3. The trial burn should provide an estimate of the residence time in both the primary and secondary reactors.

4. The trial burn should justify the use of 100% excess air. Additional air serves as an added dilution to the process and should be taken into account when calculating the destruction removal efficiency.

CONTROL SYSTEM

1. The HEPA filters should be continuously monitored for failure or build up. An indicator such as pressure drop across the HEPA filter should be monitored as a measure of the filter's performance. Monitoring of the filter system should be connected to the automatic waste feed cutoff system.

2. The automatic waste feed cut off system should fail closed so that if any of the monitoring devices should fail then the feed should shut off. The facility should explain how the control system is set to fail safe.

3. CO monitoring and control should be clearly explained. What will be the set points for the two stages of CO control? What CO levels are expected based on previous demonstration of the incinerator?

4. The trial burn plan states that waste is not allowed to be fed to the incinerator until the bed temperature has reached the allowable operating range. Explain how the feed to the bed is restricted during start-up and shut-down periods.

MONITORING:

1. The facility should calculate mass balances on the complete incinerator system as a check on the monitoring and analysis. In particular, component mass balances should be conducted on uranium and plutonium to assure that the radioactive constituents are completely tracked.
2. The analysis of ash and residues plays a key role in monitoring the incinerator's performance. Does the predicted ash level of 17.1 lb/hr represent strictly residues from the solid waste runs or are the liquid runs averaged with the solid runs? What hazardous and radioactive constituent levels are expected in the ash, cyclone residues, and filters? What parameters will the ash, cyclone residues, and filters be analyzed for?
3. The trial burn plan references that some waste streams will produce acidic compounds and must be neutralized in the bed. Acidic compounds formed during the incineration are neutralized in the bed material with sodium carbonate. Identify the waste components which can result in acid corrosion, and explain how the completeness of the neutralization process will be monitored. How will these waste components be identified and managed during on-going operations?
4. Radioactive monitoring should be described in more detail. What is the accuracy of the uranium monitoring and the plutonium monitoring? Have more accurate methods been investigated? What continuous radioactive monitoring is available and what type of continuous monitoring is in place? Will the offgas radioactive monitoring detect radionuclides in all forms? What monitoring is in place after all the HEPA filters?
5. The trial burn plan should explain how all monitoring will be documented so that a future record will exist for independent scrutiny.
6. All offgas analysis should be conducted by an EPA-approved laboratory. The facility should identify the laboratories which will be conducting the analysis.

EMISSIONS:

- down* →
1. The facility should explain the HEPA filtration system in more detail. What are the limitations of the HEPA filters? How efficient is the filter system in removing particulates less than 0.3 microns? How are the filters tested? As stated previously the efficiencies of the filter system should be backed by actual data.
 2. The facility should document the expected composition, levels, and rates of the incinerator emissions. These estimated emission levels should include calculations and assumptions. If dispersion is taken into account, the air dispersion model and assumptions should be clearly explained. Air modeling should be based on conservative assumptions. Are gaseous radioactive constituents expected to be present? If so, how will their release be prevented? How do these expected emission levels compare to background, total plant emissions, and established standards?
 3. More information should be included on the particulate cyclones and the sintered metal filters. What is the expected particulate distribution and efficiency of each device? What is the pressure drop across each device?

ONGOING OPERATIONS.

1. The long term operations of any hazardous or mixed waste unit at the Rocky Flats Plant will be covered under a Colorado Hazardous Waste Permit. However, the fluidized bed incinerator is currently regulated as an interim status unit. The facility has expressed a need to begin on-going incineration after the trial burn but prior to the issuance of the hazardous waste permit under the interim status provisions. The facility should provide the rationale for the need to conduct this incineration under interim status. The facility should also provide a complete waste analysis of the materials which will be incinerated during this period and a complete description of how the incinerator will be operated. This description should include operating ranges for the incinerator control variables, operating protocols, the frequency of operation, and the monitoring and sampling which will be conducted. This incineration should not proceed until all information from the trial burn has been evaluated and the incinerator has demonstrated that it operates in accordance with all applicable standards. Provided this demonstration is made, the incinerator should operate as stringently as the conditions which are established in the trial burn.

2. The amount of waste proposed for incineration which is currently being stored should be clarified. As specified above, these wastes should be completely characterized.

3. The facility has proposed that the incinerator be used for hazardous waste and low-level mixed waste and only for wastes produced on-site. The facility has not specified use of the incinerator for transuranic wastes or off-site wastes. The facility should clearly state whether or not they will request use of the fluidized bed incinerator for either transuranic wastes or any off-site wastes.

4. How will incineration residues (including ash, HEPA filters, waste drums, etc) be handled?

5. The incinerator and air pollution control equipment should be inspected after the trial burn for any signs of degradation. These procedures should be specified.

CONTINGENCY MEASURES:

1. The facility should describe the contingency measures which are in place to respond to any emergency situations. What are the response steps which will be taken to respond to a fire, spill, release or other emergency?

2. What precautions have been taken in the design and operation of the incinerator to prevent an emergency incident? Specifically, a past fire at the facility was related to an incineration operation. What procedures have been established with the fluidized bed to prevent such a reoccurrence?

3. What fail safe measures are in place regarding the filter system? Will the filter system remain effective during an emergency?

*Answer
NCA?*

ALTERNATIVES

1. Incineration is the facility's proposed alternative to the practices of land disposal which have been used in the past. What other alternatives to fluidized bed incineration have been evaluated, and what are the long and short term results? The facility should evaluate both short term alternatives such as storage, or other existing onsite treatment, and long term alternatives such as offsite treatment, other forms of incineration, recycling, waste reduction, or other onsite treatment.

CDH Comments of January 22, 1986 on the
Trial Burn Plan Submittal of October 22

Design Comments:

The following factors affect the ability of the incinerator to achieve the regulatory destruction/removal efficiency. The trial burn plan does not investigate these factors to the extent necessary to demonstrate the allowable flexibility during the operation of the incinerator under a permit. These factors must be varied in the trial burn to demonstrate their operating ranges or their ranges will be restricted in a permit. Alternatively, it may be possible for the applicant to supply information which clearly demonstrates the effect of changes in these factors.

1.(Thermal Capacity) The design thermal capacity of the incinerator is listed at 1.5 million BTU/hr. Feed rates for the trial burn are set at 60 lbs/hr for liquid waste tests and 150 lbs/hr for solid waste tests. How were these feed limits set? They do not appear to correspond directly to the design thermal capacity. What is the incinerator's minimum thermal feed rate?

2.(Turbulence) The gas flow rate to the primary reactor is maintained at 250 CFM (p.8). What is the allowable range for this rate? What rate is necessary to achieve fluidization and sufficient turbulence? How is residence time in the reactor affected by increases in the gas flow.

3.(Sodium Carbonate) Sodium carbonate is consumed through the formation of halogen, sulfur, and phosphorus salts and by loss through the outgas to the first reactor. How, and at what rate must the sodium carbonate be replaced? How is the replacement rate monitored?

How are the salts that are formed separated from the bed solution? How are they carried off by the off gas while the bed mixture remains behind? Does build up of these salts occur in the bed mixture?

4.(Oxidation Catalyst) At what rate must the oxidation catalyst be replaced? What chemicals must be screened for as inhibitors to the catalyst? The catalyst percentage can range from 10%-80%, at what level will the catalyst percentage be set for the trial burn?

Control and Monitoring:

5.(Afterburner Control) The afterburner temperature is controlled by a spray cooling system and waste feed to the primary incinerator, but it is unclear how the waste feed is changed in response to a temperature variation. In addition, does this control system prevent the possibility of a run-away response? How will these control responses be monitored during the trial burn?

To address these issues, the trial burn should identify all parameters which are to be recorded and identify those parameters which will be recorded continuously. In addition, the trial burn should identify which variable indicators are displayed at the control panel, which will be printed out on a chart, and which will be recorded on disk. This information can then be used to evaluate control/response performance.

6.(Monitoring of Feed Rate) The feed rate to the incinerator is an important variable for controlling such factors as the total loadings of halogens, ash, BTUs, etc... which are allowable. The trial burn plan should specify how both solid and liquid feed rates will be monitored, and the frequency or monitoring.

7.(Automatic Waste Feed Cutoff) The automatic waste feed cutoff system should be tested during the trial burn for each of the cutoff parameters. These tests should be included in the overall schedule.

All cutoff parameters should be connected to both the solid waste feed and the liquid waste feed. This action is unclear in the plan.

The following variables should be added as automatic waste feed cutoff variables.

- Primary Bed Reactor Temperature (Both high and low set points)
- Combustion Gas Velocity(The combustion gas velocity should be measured more directly through a mass flow rate monitoring device instead of indirectly through the measurement of oxygen concentration.

8.(Manual Versus Automatic Control) The trial burn states that the incinerator control system is a combination of both manual and automatic control. Some variables may be controlled by either mechanism. The automatic waste feed cutoff system should generally not be overridden by manual control. A description of how access to manual override of the automatic waste feed cutoff system is restricted and controlled, should be provided.

9.(Sampling Locations) Some amount of dilution is introduced into the out gas flow system upstream of the sampling points through the canyon air inputs. The amount of dilution should be accurately monitored and accounted for in emission calculations. This procedure should be described in the trial burn plan along with the specific information on the flow rate monitoring equipment.

10.(CO Monitoring) CO monitoring occurs after the catalytic reactor. Consequently, CO upsets in the primary and secondary reactors could be buffered by the catalytic reactor. In other words, placing the CO monitoring equipment after the catalytic reactor results in a less sensitive monitoring of CO changes from upset in the primary and secondary reactors. The trial burn should investigate if the difference in the location of monitoring is significant. The sensitivity of the CO monitor in its proposed location, and any operating variable changes on the catalytic reactor, should be evaluated.

Additional Comments:

11.(Design Feed Limitations) Limitations on the feed systems with regards to such parameters as viscosity, particle size, etc... should be described.

12.(Uranium Analysis) The trial burn plan proposes uranium as one of the constituents of the solid waste feed. Uranium is selected as a relatively safe means of demonstrating how the incinerator and associated stack gas cleaning system can remove radioactive constituents. However, the trial burn plan should describe how exactly the trial burn will make this demonstration. The trial burn should include:

- an estimation of the expected radioactive emission concentrations
- an explanation of how the test burn information for uranium removal will be used to demonstrate the systems ability to remove other radioactive particulates.
- an estimation of the maximum radioactive constituent concentrations to be accepted at the incinerator during on going operations
- a description of testing and monitoring which has been conducted at the site, or elsewhere, which demonstrates the effectiveness of the air pollution control system on removing radioactive constituents

13.(Identification of PICs)The trial burn plan should clearly specify which products of incomplete combustion (PICs) will be analyzed for during the trial burn. The plan implies that dioxins, furans, dibenzodioxins, and dibenzofurans, will be analyze for as possible PICs. We commend the decision of analyzing samples for these constituents; we are simply requesting that these be clearly identified.

14.(Air Pollution Control Permit) The proposed trial burn and future operation of the incinerator may require modification to the existing Air Pollution Control Permit. DOE/Rockwell should contact the Air Pollution Control Division of CDH to determine whether any modification is necessary. (Contact - John Plog x. 331-8500)

Region VIII EPA - Rocky Flats Trial Burn Plan Comments
March 9, 1987

The following comments are based on EPA Region VIII's present knowledge regarding hazardous waste incinerators (HWIs), as well as EPA's 40 CFR 264 Subpart O, 270.19 and 270.62 incinerator requirements. Comments are also based on yet to be published guidance documents which are presently under national review and development*. These documents will substantially clarify requirements and standards for HWI permitting. It is prudent to provide the following guidance to DOE to assure the best possible engineering management for the plutonium and waste processing proposals presented in their Part B permit application of November, 1986.

1. DOE's Trial Burn Plan for the production unit is comprehensive and well organized. The strongest areas in the plan are the analytical testing, sampling and calibration methodologies and the quality assurance/quality control procedures outlined by DOE's contractor, Roy F. Weston, Inc.

Also submitted in the Part B permit application, is a trial burn plan for the pilot plant incinerator (see Appendix D-4 of the permit application). The pilot plant is a scaled down version of the "production" unit for which DOE is seeking approval of a trial burn. DOE's expressed intention is to show the two units are equivalent as far as operational characteristics are concerned (see page D-4-1). DOE then plans to use the pilot plant for future research to obtain data for additional and/or new waste streams which DOE would consider as candidates for waste reduction in the "production" unit incinerator.

It is widely accepted by EPA incinerator experts that no two incinerators (thermo/chemical processes) are exactly the same, even if they are the same size, built by the same company, at the same location and processing the same waste streams. Therefore, should DOE prove this technology on some other incinerator, in some other location, EPA and CDH would require that trial burns be conducted for any on-site units, addressing specific waste streams to be burned.

- * Guidance on Trial Burn Reporting and Setting Permit Conditions
Under preparation for EPA by Acurex Corp.

Guidelines For Continuous Monitoring of Carbon Monoxide at Hazardous Waste Incinerators
Under preparation for EPA by Pacific Environmental Services

EPA has published requirements and guidance for permitting Research, Demonstration and Development (RD&D) permits. Should DOE desire a RD&D permit, they should clearly identify this intent. If it is DOE's intent to obtain an operational Part B permit for the pilot unit, DOE should clearly state this.

2. DOE gives a design thermal capacity for the incinerator of 1,500,000 BTU/hr. (see page D-3-4 of the Trial Burn Plans). The plan also gives temperature ranges within which the incinerator will be operated, but this is not enough information for a permit writer to base operating condition decisions on. A correlation between operating temperatures, feed rates, feed BTU rates and optimum and minimum thermal capacity should be calculated and reported in order to allow CDH and EPA to establish, agree to and/or set testing and/or permit operation conditions. These minimum or optimum thermal capacities will remain fairly constant during incinerator operation and would be controlled by several factors. The main influential parameters which effect these thermal capacities would be process temperatures, gas flow rates, and waste feed/fuel blending.

DOE should submit a minimum or optimum thermal capacity which would indicate the appropriate operation parameters, under all waste feed conditions, for efficient chemical/thermal reaction. Further information requirements regarding the process unit design could be satisfied by submitting a mass/energy balance for the unit (also see comment #26).

3. Fluid bed technology is significantly influenced by gas flow rates. Attrition of the bed material and, therefore, particulate carryover, is influenced by characteristic flow rates of the units. Superficial gas velocity of the incinerator (primary reactor) is approximately 0.6 meters/second (2 ft/s). Gas velocity entering the cyclone separator is 30.5 m/s. The increased velocity of gas flow to the separators is due to restricted volumes in the piping under the relatively stable vacuum provided by the air ejector. The general gas flow rate has been expressed as 680 cu. ft./min. downstream of the afterburner (see page D-3-79 of the plan).

DOE should supply available calculations for relative retention times in each reactor. Also, a maximum gas flow rate, which influences undesirable rates of bed attrition, should be indicated. DOE should provide information on where and how gas flow will be measured. Gas flow parameters should not be based on measured O₂ concentration alone, but by direct mass flow measurement as well (also see comment #26).

4. As indicated in the plan, the fluid bed media of the primary reaction chamber consists of sodium carbonate and oxidation catalyst [i.e. chromic oxide on alumina oxidation catalyst (Al_2O_3)]. The secondary reaction chamber (catalytic afterburner) consists of a fluid bed media of chromic oxide on alumina oxidation catalyst.

DOE should identify under what specific conditions the percentage of catalyst is changed in order to address various waste feed streams. If the catalyst concentration is varied for different levels of feed material concentrations, then DOE should present information which would allow CDH and EPA to determine whether or not a specific catalyst permit condition for effective destruction removal efficiency (DRE) is warranted.

The concentration of catalyst in the trial burn runs should be such that everyday operations will be more conservative toward the destruction of hazardous wastes than the test conditions (if catalyst concentration is truly a major operation parameter). It is noted here that the trial burn plan states bed material is attritioned and/or allutriated. This indicates that standard operating conditions, wherein catalyst is added to the bed material, is a routine operation. If this operation significantly influences the effectiveness of the unit, EPA and CDH would consider setting a standard permit condition based on this parameter.

5. DOE should include a waste feed cutoff system(s) test during the trial burn. Operating parameters during waste feed cutoff conditions should be recorded and reported in the trial burn report. DOE identifies five control parameters for waste feed cutoff (see page D-3-12 of the Trial Burn Plan). Each of these control modes should be tested in order to determine their effectiveness. Should there be a waste feed cutoff based on a change in pressure differential across the HEPA filter bank(s)? Is the pressure dependent waste feed cutoff device, which monitors the secondary reaction chamber, capable of adequately detecting back pressure changes within the HEPA filters?
6. DOE should describe how all unit temperature indicators and controllers will be recorded and tied into the waste feed cutoff systems (i.e. primary, secondary reactors, catalytic combustor and heat exchanger temperatures).

DOE should also indicate whether or not a high temperature cutoff is needed. One reason for this is the concern for the potential that metal and radioactive materials could be oxidized or entrained in gaseous wastestreams and carried into the various pollution control devices. At the maximum temperatures of operation, 610°C (1136°F), and 650°C (1228°F), there may be a potential for radioactive materials being oxidized. However, within the temperature ranges and flow rates, it is more likely that a potential exists for these radioactive materials to be entrained in gaseous waste streams

7. Studies have indicated that trace metals emissions can pose a greater health hazard than organic or acid emission currently regulated under RCRA. DOE proposes that total chromium will be tested in the emissions analyses (see page D-3-38 of the Plan). Chromium is an obvious candidate due to bed material.

DOE should address whether or not there are any other metals of concern in emissions based on solid waste feed streams, and ash particulate entrainment (i.e. beryllium, tritium, cadmium, mercury, silver, arsenic, nickel, lead, etc.).

The processes involved in the generation of trace element emissions from high temperature incineration are very complex. Metals exposed to hot, oxygen-depleted zones, following burnout of organic matter, can be involved in several potential paths. In responding to this issue, DOE should address each of the following concerns relative to their specific process:

- o Vaporization of metals at sufficiently high temperatures (EPA notes that DOE's process occurs at relatively low temperatures);
- o Melting of metals to form a liquid and removal or entrainment of particles in the inorganic portion of the waste effluents (i.e. gas wastestreams and ash),
- o Reaction with other species (e.g., Cl, F, etc.) to form other compounds which can vaporize, melt, or remain unchanged.

Depending on the paths, metals may be either discharged with the ash residue or condensed into fine particles. DOE should estimate the particle sizes of these metals and present how they are or are not effectively removed by their air pollution control equipment.

8. The current RCRA Standard for Potentially Organic Hazardous Constituent (POHC) destruction is air emission based. In calculating POHC DRE, DOE will be given credit for unburned/unreacted POHCs in the ash residues. Excessive transfer of waste feed POHCs into ash negates the benefit of the thermal treatment process. Considering the relatively low operation temperatures at which this system will be operated, the potential for this type of carry over into ash is high. With the recent land disposal restrictions, DOE will be required to closely and accurately analyze the ash content for organics, as well as metals and radioactive materials.

DOE should provide any information which would address the potential for carryover, or particle adsorption and absorption of organics moving into the ash systems.

9. DOE should monitor and record the pressure drops across all the pollution control equipment and ash collection equipment as an indicator of pollution control efficiency. From DOE's flow diagram (page D-3-24), the following pressure indicators should be monitored and recorded:

primary reaction chamber: PI-2 & PI-3
primary cyclone: PI-4 & PI-5
secondary reaction chamber: PI-6 & PI-7
secondary cyclone: PI-8 & PI-9
sintered metal filters: PI-9 & PI-10
catalytic reactor and heat exchanger. PI-10 & PI-11

DOE should explain why there isn't another pressure sensor between the catalytic reactor and heat exchanger.

10. DOE should report what special procedures are practiced at the facility to prevent inadvertent or unintentional operator error, such as, the manual override of automatic controls while operations are within permitted ranges.
11. DOE's Trial Burn Plans need to identify and justify the locations of the CO continuous emissions monitors (CEMs) more clearly. DOE does refer to EPA's standards for location (see page D-3-33 and figure 10 of the Trial Burn Plan) by restating EPA's reference method 1 for effective location based on stack diameter distance (40 CFR Title 60, Appendix A). However, DOE's description and justification for the CEM sampling locations is incomplete when considering other concerns for obtaining a representative sample.

The most important factor for accurate CO monitoring is the assurance that a representative sample is collected. To achieve this, there should be minimum stratification of gas-phase pollutants, in the effluent (i.e. concentrations must be uniform across the stack system at the point(s) of sampling). The proposed sampling/monitoring locations in the trial burn plan, 1 and 2 (see figure 9), could be inadequate. It could prove quite costly if DOE, EPA, or CDH determine that stratification testing should have been conducted at sampling locations prior to the trial burn and CO data is considered invalid after the trial burn has already been conducted.

For sample location 2 (figure 11 was not provided in the Trial Burn Plan), DOE needs to justify why stratification testing data is not collected and/or reported. This is important in sampling/monitoring location 2 due to the fact that room air is introduced up stream from the sampling/monitoring location.

The location of sampling/monitoring at point 1 appears more appropriate for meeting EPA's criteria (from a representative gas stream aspect). A diagram for the location of sampling point one is given and is based on EPA's stack diameter criteria. However, sample point 1 may subject sampling probes to adverse operational conditions as well as adverse stratification effects from "canyon air" (see the process flow diagram on page D-3-24 and Figure 10 of the Trial Burn Plans). The Trial Burn Plan does state that acidic gases are neutralized by the reactor bed materials.

DOE should submit information explaining whether or not there are any acidic gases or adverse temperatures present in the exhaust which would adversely effect sample probes. Also, information should be submitted regarding how the catalytic reactor, "canyon air" and the process heat exchanger, impact CO concentrations and/or gas stream stratification.

12. It is not exactly clear what DOE's intentions for these two sampling points are. DOE should clarify whether or not these sampling points will be redundant sampling/monitoring ports or are included only in the trial burn to determine which monitoring location is better. DOE should also define whether or not normal operation CEMs will extract samples from both locations.

To further clarify the intended use of these sampling ports, DOE should specify which of the parameters tested for in Table 2 (page D-3-38) will be used as CEM sampling parameters after the trial burn.

13. DOE should supply a more complete list of parameters which will be directly monitored as well as recorded during normal operations. Key operating parameters, as well as continuous emissions monitors (CEMs), tests, calibrations, repairs, and checks on CEMs are subject to reporting requirements for HWIs. These instrument inspections and testings are subject to daily, weekly, monthly, and/or yearly reporting requirements.
14. 40 CFR 264.343(b) requires that an incinerator burning hazardous waste and producing stack emissions of more than 1.8 kilograms per hour (4 pounds per hour) of hydrogen chloride (HCL) must control HCL emissions such that the rate of emission is no greater than the larger of either 1.8 kilograms per hour or 1% of the HCL in stack gas prior to entering any pollution control equipment. DOE should be prepared to address the concern that HCL is being measured after air pollution control equipment in the trial burn. This is due to practical sampling concerns and may be justified by the expected low level of acid gases.

15. During the January 8, 1987, meeting, Nathaniel Miullo of EPA suggested that DOE do one of two things with relation to radioactive materials in the trial burn. Either test an actual amount of plutonium (spiked amount) as a trial burn waste stream, or use only uranium and provide information which would adequately describe the thermo/chemical relationship between plutonium and uranium. If enough correlation can be shown between uranium processing and plutonium processing, then it may be possible to justify allowing the permitted waste feeds to contain limited amounts of plutonium (from depleted sources). However, Mr Miullo strongly urged that actual plutonium be included in the test waste stream in order to determine the specific amount which would be present in the exhaust gases for this system.

On February 24, 1987, during the Data Exchange Meeting, DOE announced that it planned to use plutonium in the trial burn waste feed stream. CDH urged that uranium be used first. If no uranium is indicated by stack emissions tests, then the plutonium tests could be conducted. CDH's approach should be implemented. However, it will impact DOE's proposed trial burn schedule (see page D-4-74 of the Trial Burn Plan). The plutonium related runs of the second and third weeks may need to be delayed so that analytical results from the uranium test runs can be reviewed.

16. Colorado is the first State to have received authorization for mixed wastes and the potential endangerment and/or health risk is of particular concern while dealing with radioactive materials such as plutonium. It is expected, by considering the small amounts of depleted uranium and plutonium which are predicted to be in the waste feed, that the amounts in the emissions will not be detectable.

DOE should provide calculations for the expected amounts of plutonium and uranium which would be emitted from the stack during full load conditions, normal conditions, a HEPA filter failure mode (breakthrough), and an expected exposure rate for various locations down wind of the operation. All calculations and assumptions, including a complete description of dispersion models used, should be presented.

Along these lines, trial burn tests should be conducted during optimum meteorological conditions. DOE should propose what conditions it plans to operate the trial burn under.

17. DOE's plan includes a complicated processing and conveyor system for solid wastes. One of the major permit conditions will set the maximum feed rates.

For liquids, measuring and recording amounts fed into the incinerator should be uncomplicated. DOE specifies the waste feed mixing practices (i.e. table 8 of the Trial Burn Plan). However, DOE has not provided specific analytical results of the liquid mixed wastestream. This places a substantial verification and recording burden upon DOE to assure that a specified BTU level, or BTU range, is met at all times during actual operation.

Unless a specific analytical test on all waste feed streams is performed and results submitted, DOE should explain why knowledge of waste streams, in lieu of analytic data, is sufficient information for issuance of a draft permit. A trial burn, however, can use a surrogate wastestream, as is proposed by DOE.

For solids, DOE proposes that the rotational speed of the screw conveyor, feeding the primary reaction chamber, be dependent upon O₂ level, pressure in the secondary reaction chamber CO level, temperature, and gas velocity. EPA believes that DOE's intent is to indicate waste feed cutoff is dependent upon those factors, and not screw rotational speed.

The primary feed rate indicator for the solids can be based on volumetric, weight, or mass flow measurements. The most accurate method of waste feed monitoring would involve measurements taken prior to the introduction of the solid waste stream to the shredding and conveyer systems [minus the amount removed in the disposal bag and tramp metal drum (see figure 2 on page D-3-8)].

Another method for solid waste feed measurement is based on calculations of the volumetric flow rate of the screw. DOE would need to include a tachometer to measure and record the rpm rate of the screw feeder, and multiply this by the volume fed by one complete revolution of the screw. The tachometer method is desirable due to the fact that it gives a "real time" indication of the solids being introduced into the primary combustion chamber at any given point in the process. This is provided that the tachometer and volumetric calculations are calibrated properly for accurate measurements.

DOE should explore the following types of flow meter technologies and present which option would best suit their specific needs

SOLIDS	LIQUIDS
Level Indicators. Ultrasonic, Nuclear and Radio Frequency	Rotameter
Stationary Weight Indicators	Orifice Meter
Conveyor Weight Systems	Positive Displacement Meter
Impact and/or Momentum Flow Meters	Coriolis Flow Meter

18. EPA supports DOE's use of surrogate organic waste streams for the trial burn. DOE's justification is based on incinerability criteria for the difficult to destroy, carbon tetrachloride, spiked wastestream. Surrogate waste streams for trial burns is further justified based on recent non-flame thermal decomposition data for several hazardous organic compounds compiled by the University of Dayton (Dellinger, et.al., 1984, 1985, 1986). This data not only gives indications that heat of combustion is an important consideration, but shows that CO emissions may be a good indicator for the efficiency of the overall thermal/chemical removal system.

Formation of products of incomplete combustion, and therefore emissions, may be indicated by high levels of CO. Recording CO concentration levels, during a trial burn, and using a difficult to burn surrogate material, which has experimental data verifying residence times and temperatures for effective destruction and removal efficiency (such as carbon tetrachloride) is a good way to assure other organic compounds will be effectively destroyed (see Tables 9 and 10 of the Trial Burn Plan).

19. CO levels proposed by DOE are not within proposed limits EPA will publish prior to issuance of the permit. DOE has proposed a two tier CO level. Although this is a good approach to assuring undesired shutdown due to upset conditions, the levels which DOE proposes are beyond that which EPA will publish in guidance documents now being developed. EPA's standards indicate that the upper CO limit is not to exceed 100 ppm averaged over 60 minutes and 500 ppm over 10 minutes. DOE's proposed method of measuring these "windows", or time weighted averages, is appropriate due to the desire for avoiding extraneous upset conditions from excessive waste feed shutdowns. However, if the trial burn data show that the unit has capability to operate at lower levels and meet the DRE and other standards, the permitted waste cut-off levels should be lower than the above guideline levels.

DOE has proposed an "upper tier" or upper limit of 1,500 ppm for the duration of the "moving window". This is 1,000 ppm above suggested guideline amounts. Final determination of exact CO limits will be determined by the trial burn results and due consideration must be given to minimization of excessive shutdown conditions. This will assure effective reduction of undesirable emissions (i.e. high concentration "puffs" from upset conditions). However, a CO limit must be set for the trial burn. Unless DOE can provide adequate justification, EPA and CDH will require the use of the 100 and 500 ppm levels.

20. DOE should report the following parameters regarding the continuous emissions monitors:

- o Zero drift over sample time and total test time,
- o Span drift over sample time and total test time;
- o Precision;
- o Linearity;
- o Above listed parameters for each of the double range readouts.

DOE did report some percentage ranges on the flue gas monitors (see page D-3-30 of the Trial Burn Plan), but it is not clear what these ranges are referring to.

21. DOE has not identified whether or not continuous emission monitors for radioactive materials are available. If such technology exists, an in stack application of this technology would be appropriate.

DOE does employ ambient air monitors for radioactive airborne elements at various building locations, as well as throughout the facility. These monitors are not "real time" alarms, but may have some application to monitor stack emissions within building 771.

DOE should present information on whether or not ambient air monitors will be used in the area. A discussion of what localized "real time" radioactive alarm systems are available would also be useful in determining whether or not in stack radioactive monitors will be required.

22. Due to the predicted low levels of radioactive waste feed material there is little concern for a nuclear reaction which would lead to a critical mass event in the reactors. However, since radioactive materials will be handled in various storage and transportation vessels, and/or pollution control devices, as well as the reactor vessels, DOE should discuss whether or not there is any chance of a critical mass occurrence in these units. This submittal should include information regarding design and operational measures DOE has taken to assure this situation won't occur.
23. DOE should explore the possibility and feasibility of installing a parallel, redundant stack system (from before the HEPA filters on), in order to provide an immediate backup should break through of the HEPA filters occur. DOE should compare this option to the protection that the automatic waste feed cutoff technology presently built into the system offers.

The energy balance solves three equations simultaneously: (1) balancing sensible heat, heat of vaporization, and chemical heat with radiation and convection; (2) balancing radiation and convection to the walls, with conduction through the walls; and (3) balancing conduction through the walls, with convection and radiation from the outer shell of the unit to the ambient surroundings.

27. DOE has identified thirteen operation parameters which it expects to be permit operating conditions (see pages D-3-78, and D-3-79, of the Trial Burn Plan). Depending on the outcome of the trial burn, CDH and EPA may want to implement further permit conditions for operation parameters such as maximum draft or pressure in reaction chambers, temperature in the catalytic reactor, minimum oxygen at each reaction chamber exit, reactor bed catalyst feed rates, maximum hydrocarbon concentration at the stack and minimum and/or maximum pressure drop across the catalytic reactor and/or HEPA filters.

DOE should operate the trial burn conditions within various operational ranges for which they wish to be permitted. Unless the specific wastestreams and/or other operational parameters are demonstrated during the trial burn, DOE will not be allowed to change operations for such untested conditions unless a permit modification is sought.

28. Several comments and questions have been raised regarding the effectiveness and historical performance of this particular type of thermo/chemical technology. To EPA's knowledge, fluid bed technology has been effectively used throughout the nation for several years for destruction of industrial and hazardous waste streams. The advantage of this specific fluid bed technology is that it will deal effectively with both liquid and solid waste streams unique to the Rocky Flats Plant. Another positive aspect of fluid bed technology is the ability to adjust flow rates, and increase residence time for more efficient thermo/chemical destruction of organics and ash removal. Also, the thermal inertia of a fluid bed system lends very well to stable operating conditions. Stable operating conditions are desirable for both organic destruction and radioactive material removal.

During several brief discussions EPA staff has had with various representatives of government and industry, we have been unable to identify any other system that is exactly like the one RI has developed (i.e. there are fluid bed reactors that process radioactive wastes and hazardous wastes, but it is uncertain that they are of the nature of RI's reactors. They do not process the same amount and types of waste streams and they do not use the same type of air pollution control equipment).

DOE and RI should define steps it has taken to explore other technology alternatives for management and volume reduction of these wastestreams. The possibility of discovering or developing a less turbulent particle design is conducive to these types of wastestreams. Due to the precedent setting nature of this activity under RCRA, DOE and RI should provide information to identify ongoing, or developmental mixed waste recovery, volume reduction and/or destruction technologies world-wide, while CDH and EPA supports them in development of this fluid bed technology.